

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Thomas Hill et al.

Application No.: 10/532,233

Confirmation No.: 9071

Filed: April 22, 2005

Art Unit: 1793

For: REGENERATION OF A HYDROGENATION
CATALYST

Examiner: B. M. Martinez

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Madam:

As required under § 41.37(a), this brief is filed within two months of the Notice of Appeal filed in this case on March 9, 2009, and is in furtherance of said Notice of Appeal.

The fees required under § 41.20(b)(2) are dealt with in the accompanying
TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1205.2:

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|------------|---|
| I. | Real Party In Interest |
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I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

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II. RELATED APPEALS AND INTERFERENCES

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 21 claims pending in application.

B. Current Status of Claims

1. Claims canceled: 0
2. Claims withdrawn from consideration but not canceled: 0
3. Claims pending: 1-21
4. Claims allowed: 0
5. Claims rejected: 1-21

C. Claims On Appeal

The claims on appeal are claims 1-21

IV. STATUS OF AMENDMENTS

Applicants did not file an Amendment After Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention generally relates to a process for regenerating a hydrogenation catalyst. Specifically, the claimed process virtually completely regenerates a hydrogenation catalyst by stripping with a non-oxidizing gas at an elevated temperature.

According to claim 1, the claimed process comprises stripping at from 50 to 250°C with a substance or a substance mixture which under the process conditions has no oxidizing action and is present in the gaseous state and wherein the hydrogenation catalyst is formed by an active composition, which has been applied to a nonporous, metallic support and which has been used in a gas-phase selective hydrogenation of acetylene in a C₂ fraction or of propyne and/or propadiene in a C₃ fraction. See page 2, lines 8-11 and 28-33, of Applicants' disclosure.

According to claim 2, the metallic support is in the form of a woven mesh or knitted mesh. See page 4, lines 6-9, of Applicants' disclosure.

According to claim 3, the substance or substance mixture which is used for stripping is selected from the group consisting of hydrogen, nitrogen, argon and hydrocarbons. See page 2, line 35 to page 3, line 2, of Applicants' disclosure.

According to claim 4, nitrogen or a mixture of nitrogen and hydrogen is used for stripping. See page 2, line 35 to page 3, line 2, of Applicants' disclosure.

According to claim 5, stripping is carried out at from 70 to 250°C. See page 3, lines 4-5, of Applicants' disclosure.

According to claim 6, the hydrogenation catalyst is rinsed with a nonpolar organic solvent or solvent mixture in addition to stripping. See page 3, lines 11-12, of Applicants' disclosure.

According to claim 7, rinsing is carried out at ambient temperature. See page 3, lines 17-

18, of Applicants' disclosure.

According to claim 8, rinsing is carried out for a period of from 15 minutes to a plurality of days. See page 3, lines 8-9, of Applicants' disclosure.

According to claim 9, the process is carried out in situ. See page 3, lines 22-23, of Applicants' disclosure.

According to claim 10, the process is claimed is carried out ex situ. See page 3, lines 23-26, of Applicants' disclosure.

According to claim 11, the hydrogenation catalyst is firstly rinsed and subsequently stripped. See page 3, lines 28-29, of Applicants' disclosure.

According to claim 12, the process comprises regenerating the hydrogenation catalyst two or more times by stripping or by rinsing and stripping and subsequently by oxidative treatment or a combination of stripping as or rinsing and stripping and oxidative treatment. See page 3, lines 28-35, of Applicants' disclosure.

According to claim 13, the hydrogenation catalyst is a thin-film catalyst. See page 3, line 37 to page 4, line 4, of Applicants' disclosure.

According to claim 14, the hydrogenation catalyst is formed by an active composition comprising one or more hydrogenation-active metals. See page 4, lines 6-9, of Applicants' disclosure.

According to claim 15, the substance or substance mixture which is used for stripping comprises saturated hydrocarbons. See page 3, lines 11-15, of Applicants' disclosure.

According to claim 16, the saturated hydrocarbon is methane. See page 2, lines 36-38, of

Applicants' disclosure.

According to claim 17, stripping is carried out at from 100 to 150°C. See page 3, lines 4-5, of Applicants' disclosure.

According to claim 18, the process is carried out in supernatant solvent and/or in solvent circulated by means of a pump. See page 3, lines 22-23, of Applicants' disclosure.

According to claim 19, the hydrogenation-active metal is palladium. See page 4, lines 6-7, of Applicants' disclosure.

According to claim 20, the palladium is silver doped. See page 4, lines 7-8, of Applicants' disclosure.

According to claim 21, stripping is carried out at from 50 to 100°C. See page 2, lines 8-11, and page 3, lines 4-5, of Applicants' disclosure.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Has the Examiner established that Claims 1-3, 15, and 16 are obvious over the applied citations, namely, U.S. Patent No. 5,332,705 to Huang et al. in view of U.S. Patent No. 5,063,194 to Broecker et al. and that the claims are, therefore, unpatentable under 35 U.S.C. §103(a)?

B. Has the Examiner established that Claims 4, 5, 17, and 21 are obvious over the applied citations, namely, Huang in view of Broecker and in further view of White et al. (GB 907,348) and that the claims are, therefore, unpatentable under 35 U.S.C. §103(a)?

C. Has the Examiner established that Claims 6-11 and 18 are obvious over the applied citations, namely, Huang in view of Broecker and in further view of Cosyns et al. (GB 1,158,418) and that the claims are, therefore, unpatentable under 35 U.S.C. §103(a)?

D. Has the Examiner established that Claim 10 is obvious over the applied citations, namely, Huang in view of Broecker and Cosyns and in further view of White and that claim 10 is, therefore, unpatentable under 35 U.S.C. §103(a)?

E. Has the Examiner established that Claim 12 is obvious over the applied citations, namely, Huang in view of Broecker and in further view of WO 94/00232 to Huang (hereinafter "Huang II") and that claim 12 is, therefore, unpatentable under 35 U.S.C. §103(a)?

F. Has the Examiner established that Claims 13, 14, and 19 are obvious over the applied citations, namely, Huang in view of Broecker and in further view of U.S. Patent No. US 5,130,172 to Hicks et al. and that the claims are, therefore, unpatentable under 35 U.S.C. §103(a)?

G. Has the Examiner established that Claim 20 is obvious over the applied citations, namely, Huang in view of Broecker and in further view of Huang II and that claim 20 is, therefore, unpatentable under 35 U.S.C. §103(a)?

VII. ARGUMENT

A. The Office Action failed to provide a proper motivation or rationale as to why a skilled artisan would combine Huang and Broecker in the manner suggested.

Claims 1-3, 15 and 16 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,332,705 to Huang et al. in view of U.S. Patent No. 5,063,194 to Broecker et al.

Claim 1 recites, among other features, that the hydrogenation catalyst is formed by an active composition, which has been applied to a nonporous, metallic support. As appreciated by the Examiner in the December 8, 2008 Office Action, at least this feature cannot reasonably be considered to be suggested in Huang. Instead, the Office Action relies on Broecker for teaching a palladium catalyst applied to metallic meshes, foils, or fabrics. Specifically, the December 8 Office Action asserts, at paragraph 5, that "[t]hus, it would have been obvious to one of ordinary skill in the art to modify the process of Huang with the nonporous, metallic support of Broecker

because there would have been a reasonable expectation of success.” However, the Office Action fails to indicate what success would have been expected by combining Huang and Broecker.

The December 12 Office Action further asserts, at page 10, lines 4-5, that Broecker teaches the regeneration of a hydrogen catalyst. This assertion is incorrect. Broecker is directed to the development of a novel palladium catalyst and an improved process for hydrogenating compounds containing a triple bond. See col. 1, lines 49-53. Nowhere throughout the entire disclosure does Broecker teach a process for regenerating a catalyst, or that the catalysts therein may require regeneration after prolonged use. Moreover, the catalyst in Broecker has not been used in a “gas-phase selective hydrogenation of acetylene in a C₂ fraction or of propyne and/or propadiene in a C₃ fraction,” as recited in claim 1. Instead, Broecker demonstrates that the catalyst disclosed therein is capable of selectively reducing a triple bond in the conversion of hydrodehydroxalool (HDHL) to hydroxalool (HLIN).

Thus, while it may be possible that the catalyst in Broecker could be used for reducing acetylene in a C₂ fraction, throughout the entire disclosure of Broecker there is no mention that the catalyst may lose its activity over time or how the activity may be restored without losing the catalyst’s selectivity to triple bonds over double bonds.

Applicants strongly disagree with the assertion in the Office Action, at page 10, lines 12-13, that “the type of feedstock and support used are not relevant.” Quite to the contrary, the claimed process is tailored to the regeneration of a hydrogenation catalyst wherein the hydrogenation catalyst is formed by an active composition, which has been applied to a nonporous, metallic support and which has been used in a gas-phase selective hydrogenation of acetylene in a C₂ fraction or of propyne and/or propadiene in a C₃ fraction. Applicants note that GB 907,348 to White et al. suggest, at page 1, lines 26-30, that the thermal cracking of petroleum hydrocarbons tends to form a gum, possibly due to the presence of styrene, cyclopentadiene and other conjugated dienes. Huang suggests, at col. 4, lines 40-43, that different carbonaceous residues are formed on the silica or alumina catalyst support than on or near palladium. This disclosure of White and Huang is irreconcilable with the assertion in the Office Action that

feedstock and support are not relevant because the applied citations suggest that different feedstocks produce different residues and that a catalyst support is covered with different residues than the catalyst itself.

In addition, even if Huang and Broecker are combined, despite the lack of motivation or rationale to do so, a skilled artisan would not have expected the surprising and unforeseen results that can be achieved by the claimed method described throughout Applicants' disclosure. By way of non-limiting example, there was no reasonable expectation that the claimed method would restore the catalytic activity to 98% in experimental runs 1 and 4, as set forth in Table 1 on page 5 of the specification. Moreover, as set forth in Table 2 on page 7, while the carbon content of the catalyst in experiments 7 and 8 decreases less than in the classical method of comparative example C5, the relative conversion C(rel.) of the inventive examples is significantly higher with 94% than the conversion achieved by comparative example C5, which is only achieve 65 %.

The Advisory Action states that the February 9, 2009 Response does not place this application into condition for allowance for "the reasons of record." As such, Applicants have received no indication why the arguments presented in the February 9 Response are not considered persuasive. For example, the unexpected results of the claimed subject matter were not discussed in the August 13, 2008 Amendment. Therefore, the Examiner fails to meet the burden of answering all asserted advantages set forth by Applicants. Specifically, as set forth in MPEP §707.07(f) "[i]f it is the examiner's considered opinion that the asserted advantages are not sufficient to overcome the rejection(s) of record, he or she should state the reasons for his or her position in the record." This burden has not been met.

Independent claim 1 further recites stripping at from 50 to 250°C. As acknowledged in the Office Action, Huang also fails to suggest this feature of claim 1. However, the Office Action asserts that the temperature range of about 260 °C - 400 °C suggested in Huang encompasses the claimed range of 50 to 250 °C. Applicants respectfully submit that there is no indication in Huang that the range could be lower than 260 °C especially since the preferred embodiment specifically refers to 350 °C, which is 90 °C higher than the lowest temperature contemplated in

Huang. In addition, there is no disclosure in Huang concerning the degree of deviation from 260 °C contemplated by Huang. The preferred temperature range is about 315 °C – 372 °C and more preferred is about 350 °C which would lead those skilled in the art away from using a temperature below 260 °C. Applicants note that the assertion in paragraph 2 on page 9 of the Office Action that 260 °C is not indicated as a critical minimum in Huang has no bearing on what is actually suggested in Huang.

The Office Action further asserts, at page 9, paragraph 2, that White suggests stripping at a temperature of 150 °C. However, White neither suggests a nonporous, metallic support nor that such a support has been used in a gas-phase selective hydrogenation of acetylene in a C₂ fraction or of propyne and/or propadiene in a C₃ fraction, as recited in claim 1. Instead, White suggests metallic nickel on activated alumina, calcium carbonate, or sepiolite, and, further, hydrogenation of petroleum hydrocarbons, such as straight run naphta. In addition, White suggests, at page 1, line 88 to page 2, line 1, that the upper limit of temperature should obviously be below that at which damage to the catalyst or support may occur and may conveniently be 600 °C. White fails to suggest that the lower limit should be decreased. Moreover, a skilled artisan would not conclude from the disclosure in White that a process that is preferably performed at 350 °C should be performed at a lower temperature than the preferred temperature but rather that the process should not be performed at a temperature higher than 400 °C, the upper limit of the method suggested in Huang, to protect the catalyst from damage.

There is no indication in any of the applied citations why the hydrogen stripping suggested in Huang should be combined with the catalyst support suggested in Broecker and with the temperature range suggested in White.

The Office Action merely picks and chooses elements from the applied citations in support of finding the combination of all claim features without providing support from the explicit disclosure in the applied citations.

In conjunction with interpreting 35 U.S.C. §103(a) under *Graham v. John Deere*, 383 U.S. 1, 148 U.S.P.Q. 459 (1966) and *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727 (2007), the

initial burden is on the Examiner to provide some apparent reason or suggestion of the desirability of doing what Applicants did, i.e. the Examiner must establish a *prima facie* case of obviousness. To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention, or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

The mere fact that cited art may be modified in the manner suggested in the Office Action does not make the modification obvious, unless the cited art suggests the desirability of the modification or impliedly suggests the claimed invention, or the Examiner has presented a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the applied citation. In particular, the assertion in the May 13, 2008, which was repeated verbatim in the December 8, 2008 Office Action that “[t]hus, it would have been obvious to one of ordinary skill in the art to modify the process of Huang with the nonporous, metallic support of Broecker because there would have been a reasonable expectation of success,” is nothing more than a statement that Huang and Broecker can be combined based on the roadmap provided by Applicants’ disclosure. No suggestion to combine the citations in the manner suggested appears in the cited art in this matter nor has a convincing line of reasoning been presented in this case. The Board’s attention is kindly directed to *KSR Int’l Co. v. Teleflex, Inc.*, supra; *In re Dembiczak et al.* 50 USPQ2d. 1614 (Fed. Cir. 1999), *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984), *In re Laskowski*, 10 USPQ2d. 1397 (Fed. Cir. 1989) and *In re Fritch*, 23 USPQ2d. 1780 (Fed. Cir. 1992).

B. White fails to cure the deficiencies of Huang and Broecker

Claims 4, 5, 17, and 21 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Huang in view of Broecker and in further view of White et al. (GB 907,348). The Office Action relies on White for suggesting a temperature of 150 °C. However, as set forth above, White suffers from the same deficiencies as Huang in that it fails to suggest a nonporous, metallic support.

C. Cosyns fails to cure the deficiencies of Huang and Broecker

Claims 6-11 and 18 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Huang in view of Broecker and in further view of Cosyns et al. (GB 1,158,418). Cosyns is applied for suggesting rinsing a catalyst with nonpolar solvents. Cosyns is not applied in a manner to cure the deficiencies of Huang and Broecker discussed above. Therefore, claims 6-11 and 18 are patentable for at least the same reasons as claim 1 above.

D. White fails to cure the deficiencies of Huang and Broecker

Claim 10 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Huang in view of Broecker and Cosyns and in further view of White. White is applied for suggesting a regeneration process ex-situ but not to cure the deficiencies of Huang and Broecker. Therefore, claim 10 is patentable for at least the same reasons as claim 1 above.

E. Huang II fails to cure the deficiencies of Huang and Broecker

Claim 12 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Huang in view of Broecker and in further view of WO 94/00232 to Huang (hereinafter “Huang II”). Remarkably, Huang II claims priority from Huang, yet the features on which the Office Action relies on in Huang II are not supported in Huang. Specifically, the Office Action asserts that the air burn suggested in Huang II can reasonably be considered to correspond to the oxidative treatment recited in claim 12. However, Huang II suggests alumina and silica as catalyst carrier materials. Huang II fails to suggest a nonporous, metallic support, as recited in claim 1. Therefore, claim 12 is patentable for at least the same reasons as claim 1 above.

F. Hicks fails to cure the deficiencies of Huang and Broecker

Claims 13, 14, and 19 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Huang in view of Broecker and in further view of U.S. Patent No. US 5,130,172 to Hicks et al. Hicks is applied for suggesting a thin-film catalyst. However, Hicks is not applied in a

manner to cure the deficiencies of Huang and Broecker as discussed above. Therefore, claims 13, 14, and 19 are patentable for at least the same reasons as claim 1 above.

G. Huang II fails to cure the deficiencies of Huang and Broecker

Claim 20 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Huang in view of Broecker and in further view of Huang II. The Office Action asserts that Huang suggests, at page 10, lines 20-21, a silver-doped palladium catalyst. However, as set forth on page 15, line 10, of Huang II, the silver containing catalyst is provided on SiO₂ as a catalyst carrier and not on a nonporous, metallic support. Thus, again, Huang II fails to cure the deficiencies of Huang and Broecker. Therefore, claim 20 is patentable for at least the same reasons as claim 1 above.

VIII. CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above, the claims in Appendix A include the amendments filed by Applicant on August 13, 2008.

Applicants concurrently herewith submit the requisite fee for Appeal Brief Transmittal. Applicants believe no additional fee is due with this response. However, if any such additional fee is due, please charge our Deposit Account No. 22-0185, under Order No. 13156-00008-US from which the undersigned is authorized to draw.

Dated: May 6, 2009

Respectfully submitted,

Electronic signature: /Georg M. Hasselmann/
Georg M. Hasselmann
Registration No.: 62,324
CONNOLLY BOVE LODGE & HUTZ LLP
1875 Eye Street, NW
Suite 1100
Washington, DC 20006
(202) 331-7111
(202) 293-6229 (Fax)
Attorney for Applicant

APPENDIX A - CLAIMS

Claims Involved in the Appeal of Application Serial No. 10/532,233

1. A process for regenerating a hydrogenation catalyst comprising stripping at from 50 to 250°C with a substance or a substance mixture which under the process conditions has no oxidizing action and is present in the gaseous state and wherein the hydrogenation catalyst is formed by an active composition, which has been applied to a nonporous, metallic support and which has been used in a gas-phase selective hydrogenation of acetylene in a C₂ fraction or of propyne and/or propadiene in a C₃ fraction.
2. The process as claimed in claim 1, wherein the metallic support is in the form of a woven mesh or knitted mesh.
3. The process as claimed in claim 1, wherein the substance or substance mixture which is used for stripping is selected from the group consisting of hydrogen, nitrogen, argon and hydrocarbons.
4. The process as claimed in claim 3, wherein nitrogen or a mixture of nitrogen and hydrogen is used for stripping.
5. The process as claimed in claim 1, wherein stripping is carried out at from 70 to 250°C.
6. The process as claimed in claim 1, wherein the hydrogenation catalyst is rinsed with a nonpolar organic solvent or solvent mixture in addition to stripping.
7. The process as claimed in claim 6, wherein rinsing is carried out at ambient temperature.
8. The process as claimed in claim 6, wherein rinsing is carried out for a period of from 15 minutes to a plurality of days.

9. The process as claimed in claim 6 carried out in situ.
10. The process as claimed in claim 6 carried out ex situ.
11. The process as claimed in claim 6, wherein the hydrogenation catalyst is firstly rinsed and subsequently stripped.
12. A process for the repeated regeneration of a hydrogenation catalyst, which comprises regenerating the hydrogenation catalyst two or more times by stripping as claimed in claim 1 or by rinsing and stripping as claimed in claim 6 and subsequently by oxidative treatment or a combination of stripping as claimed in claim 1 or rinsing and stripping as claimed in claim 6 and oxidative treatment.
13. The process as claimed in claim 1, wherein the hydrogenation catalyst is a thin-film catalyst.
14. The process as claimed in claim 13, wherein the hydrogenation catalyst is formed by an active composition comprising one or more hydrogenation-active metals.
15. The process as claimed in claim 3, wherein the substance or substance mixture which is used for stripping comprises saturated hydrocarbons.
16. The process as claimed in claim 15, wherein the saturated hydrocarbon is methane.
17. The process as claimed in claim 5, wherein stripping is carried out at from 100 to 150°C.
18. The process as claimed in claim 9, wherein the process is carried out in supernatant solvent and/or in solvent circulated by means of a pump.
19. The process as claimed in claim 14, wherein the hydrogenation-active metal is palladium.

20. The process as claimed in claim 19, wherein palladium is silver doped.
21. The process as claimed in claim 1, wherein stripping is carried out at from 50 to 100°C.

APPENDIX B - EVIDENCE

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the examiner is being submitted.

APPENDIX C – RELATED PROCEEDINGS

No related proceedings are referenced in II. above, hence copies of decisions in related proceedings are not provided.